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OVERVIEW ON STUDIES OF MARTIAN LIKE CO₂-N₂ MIXTURE BY INDUCTIVELY COUPLED PLASMA TORCH

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ABSTRACT

The purpose of the work is to make an overview on the results obtained through the studies on martian plasmas created by inductively coupled plasma torches (ICP). As the main advantage of the ICP torch is the absence of electrode compared to the others various test facilities, the radiative properties of this kind of plasmas are of interest to propose test cases in order to validate radiation models. ICP torches can work under various operating conditions in terms of pressure, enthalpy or flow. As a consequence, the studied plasma can be either at thermodynamical equilibrium or out of equilibrium, without problems of stability in time. The presentation concerns only the plasmas formed with a martian like CO₂-N₂ mixture and all the parameters of test facilities will be precised.

The following paper corresponds to the first step of a global paper which will be proposed later and it reports only the oral presentation which has been done during the third International Workshop of RHTG.

1. INTRODUCTION

Five laboratories have been found concerning the study of CO₂ or CO₂-N₂ plasmas by inductively coupled plasma torch. The laboratories which are about to start this kind of study do not appear in this presentation.

The laboratories which have obtained results are the following :

-L.A.E.P.T. (Laboratory of Electrical Arc and Thermal Plasmas) located in Clermont-Ferrand, France;

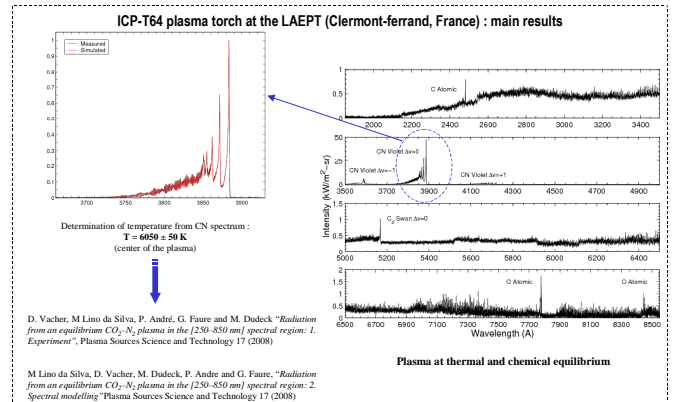
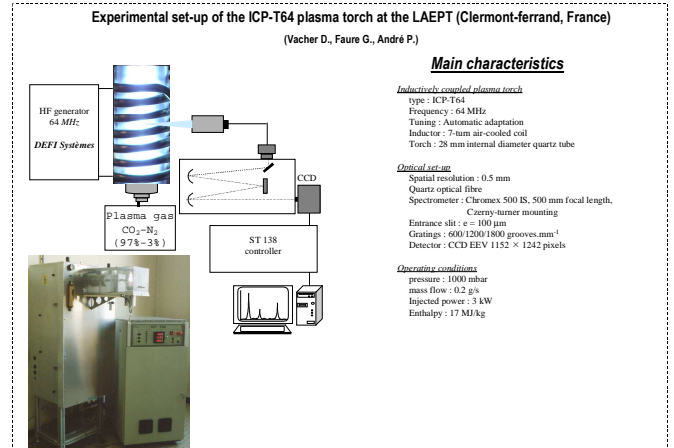
-C.O.R.I.A. (Complexe de Recherche Interprofessionnel en Aérothermochimie) located at Rouen, France;

-I.R.S. (Institut für RaumfahrtSysteme) located at Stuttgart, Germany;

-V.K.I. (Von Karman Institute) located at Rhode Saint Genese, Belgium;

-I.P.M. (Institute for Problems of Mechanics) located at Moscow, Russia.

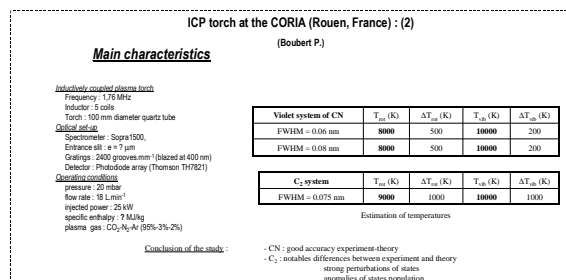
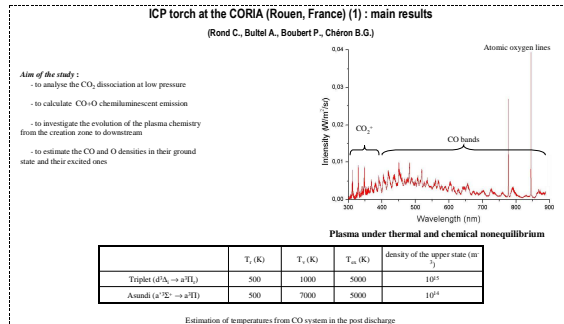
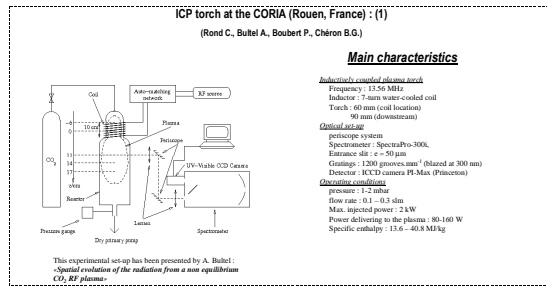
2. L.A.E.P.T. (Clermont-Ferrand, France)



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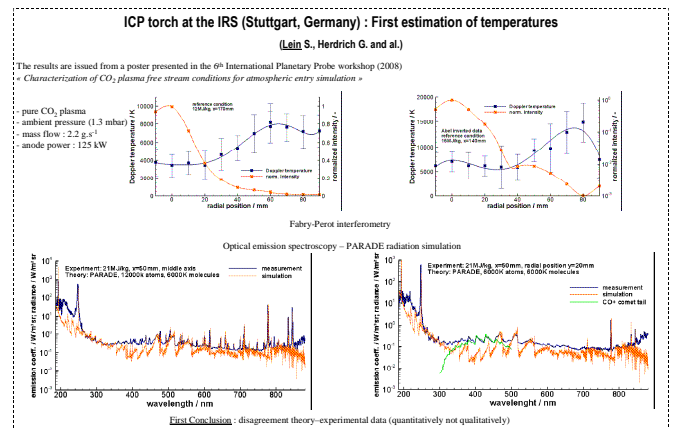
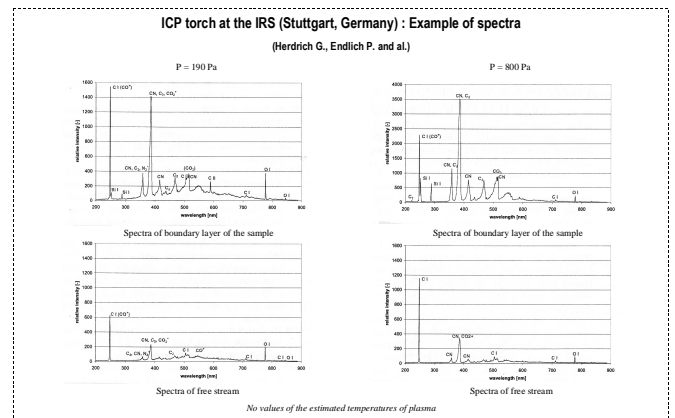
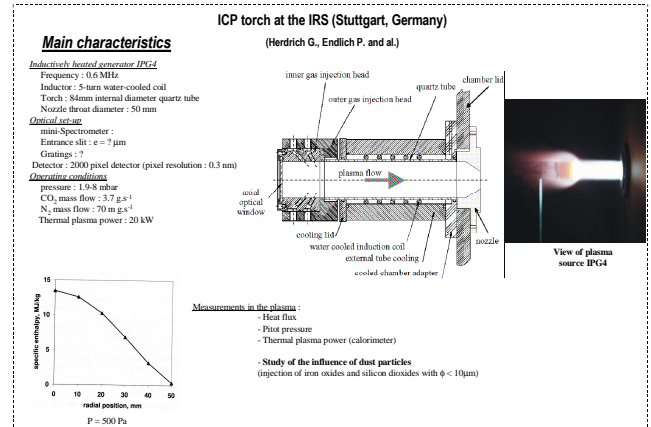
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4. I.R.S. (Stuttgart, Germany)



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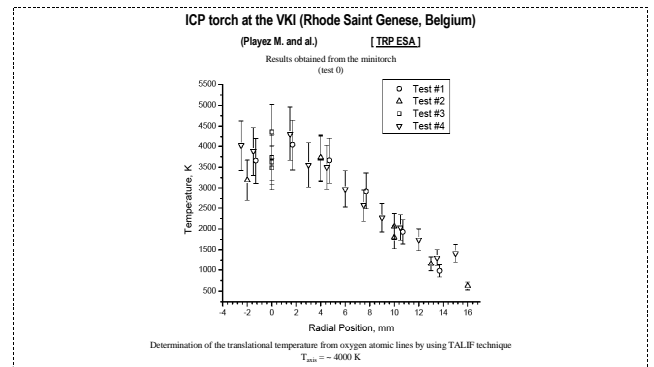
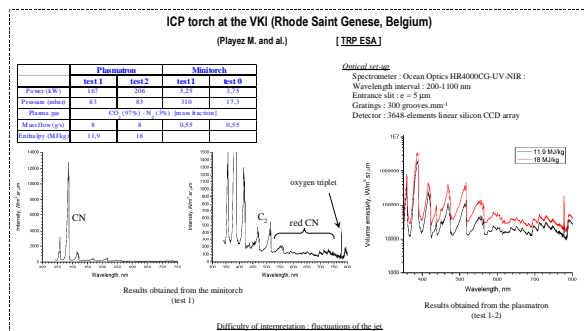
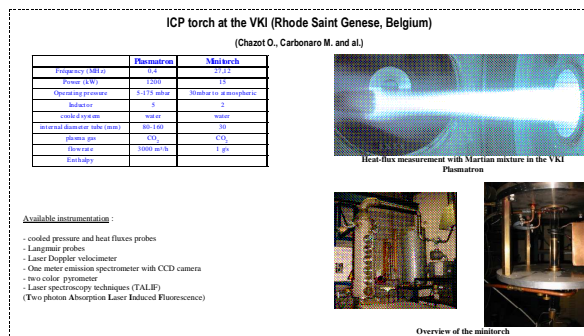
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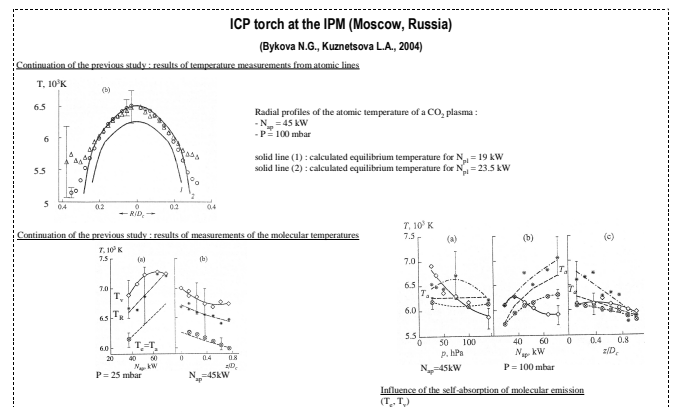
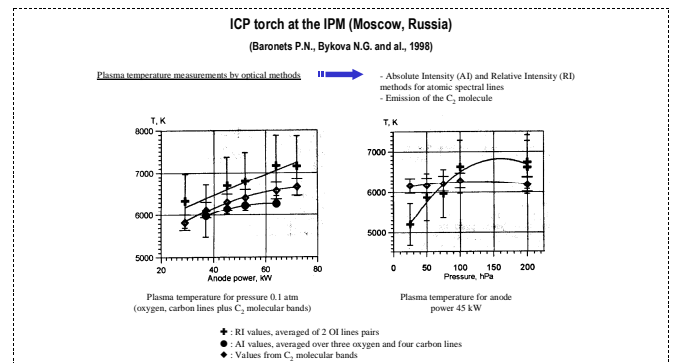
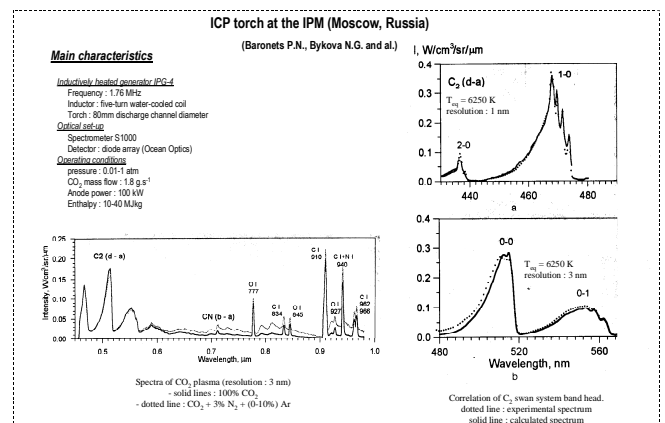
5. V.K.I. (Rhode Saint Genese, Belgium)

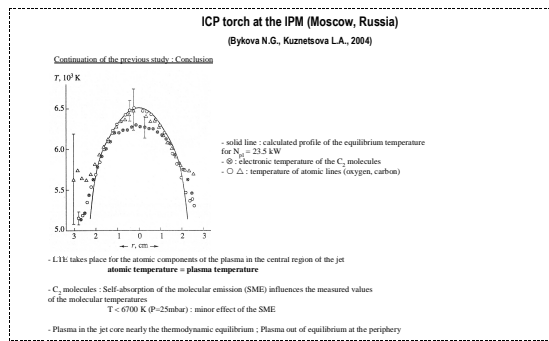


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The informations are given by M. Playez.

6. I.P.M. (Moscow, Russia)





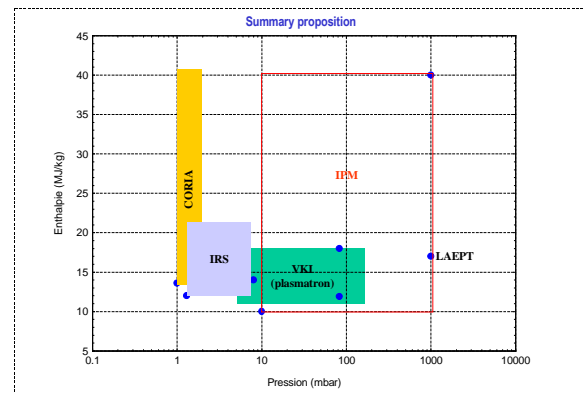
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7. CONCLUSION

A conclusion can not be done due to the fact that each laboratory works under different conditions in terms of flow, injected power, operating frequency and operating pressure. However, it is very interesting to gather all the data in order the domain of applications of each laboratory and also in order to create a connection between all these laboratories.

The following figure propose a regrouping of the data of each laboratory in terms of specific enthalpy and pressure. Of course, The field of investigation of each laboratories is likely to evolve.



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I would like to thank all the colleagues who permitted to this presentation to exist. I express all my recognition to them and thanks once again them for all the informations that they sent to me. These colleagues are : P. Boubert, A. Bultel, G. Herdrich, A.F. Kolesnikov, M. Playez and C. Rond.

I wish that the discussion will continue in order to still work together on the atmospheric entries with inductively coupled plasma torches.